

# ELECTRICAL TECHNOLOGY

Program of Studies  
2014-2015



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## Electrical Technology

Course Title	Post-Secondary Connection	Valid Course Code	Recommended Grade Level				Recommended Credit
			9	10	11	12	
Basic Blueprint Reading	BRX120	460902			X	X	.5
Basic Troubleshooting	BTX205	470317			X	X	.5
Circuits I	ENGT110	460316			X	X	.5
Circuits I Lab 1	ENGT111	460317			X	X	.5
Circuits I Lab 2	ENGT113	460318			X	X	.5
Circuits II	ENGT114	460319			X	X	.5
Circuits II, Lab 1	ENGT 115	460320			X	X	.5
Circuits II, Lab2	ENGT117	460322			X	X	.5
CO-OP Education	EET 198	460345				X	1
Digital Literacy	DLC100	48101	X	X	X	X	1
Electrical Construction I	EET154	460312			X	X	.5
Electrical Construction I Lab	EET155	460314			X	X	.5
Electrical Construction II	EET252	460313			X	X	.5
Electrical Construction II Lab	EET253	460315			X	X	.5
Electrical Motor Controls I	EET270	460331			X	X	.5
Electrical Motor Controls I Lab	EET271	460332			X	X	.5
Industrial Safety	ISX 100	460301		X	X	X	.5
Internship	EET198	460348				X	1
National Electrical Code	EET250	460339		X	X	X	.5
Personal Finance	BAS 120	060170			X	X	.5
Renewable Energy Systems	ENM140	460342			X	X	.5
Renewable Energy Systems Lab	ENM141	460343			X	X	.5
Rotating Machinery	EET264	460323			X	X	.5
Rotating	EET268	460325			X	X	.5

<b>Machinery Electrical Motor Controls I</b>							
<b>Rotating Machinery Electrical Motor Controls I Lab</b>	<b>EET269</b>	<b>460326</b>			<b>X</b>	<b>X</b>	<b>.5</b>
<b>Rotating Machinery Lab</b>	<b>EET265</b>	<b>460324</b>			<b>X</b>	<b>X</b>	<b>.5</b>
<b>Special Problems I (Electric)</b>	<b>EET281</b>	<b>460377</b>				<b>X</b>	<b>1</b>
<b>Sustainable Energy Systems</b>	<b>ENM130</b>	<b>460340</b>			<b>X</b>	<b>X</b>	<b>.5</b>
<b>Sustainable Energy Systems Lab</b>	<b>ENM131</b>	<b>460341</b>			<b>X</b>	<b>X</b>	<b>.5</b>
<b>Transformers</b>	<b>EET150</b>	<b>460305</b>			<b>X</b>	<b>X</b>	<b>1</b>
<b>Transformers Lab</b>	<b>EET151</b>	<b>460307</b>			<b>X</b>	<b>X</b>	<b>.5</b>

# ELECTRICAL TECHNOLOGY

## Program Description

The Construction Technology programs will prepare students for work in new construction, remodel, and energy auditing industries. Course offerings include everything from entry level trades courses, all the way to national certification. Students will train at the career centers, high schools and at real jobsites. Current and traditional building practices are included, while updated and advanced framing techniques, energy efficiency, health and safety, and sustainability methods are emphasized.

Construction Pre-Apprenticeship courses are included that focus on new construction, carpentry, and other building trades. Students learn about the tools and techniques used in the construction industries. The students may gain skills in Air Conditioning Technology, Building and Apartment Maintenance, Carpentry, Electrical Technology, Masonry and Plumbing. They are also introduced to green building methods and materials. The Building Performance and Energy Assessment courses shift that focus to analyzing existing homes.

Weatherization, Building Performance and Energy Assessment industries are helping families reduce their energy burden, while maintaining comfort and safety. Our students will learn the national standard and protocols for energy auditing, combustion appliance safety, and energy modeling. Successful students are prepared to take the national certification exams for building analysts and energy auditors.

Course offerings are intended to promote career ladders for those just entering the industry, as well as industry professionals looking to stay current. There are multiple certificates and degree options and inter-related disciplines at the Career Centers having articulation agreements with various post-secondary institutions.

## MODEL COURSE SEQUENCE

KDE Career Pathways Electrical technology		
Career Pathway	Pathway Courses	Elective Courses
<p style="text-align: center;"><b>Electrician Helper</b> CIP 46.0302.02.</p> <p><u><i>Tests for Certification:</i></u></p> <ul style="list-style-type: none"> <li>• KOSSA – Construction Test</li> <li>• NCCER – CORE Curriculum</li> <li>• NCCER – Electricity Level 1</li> </ul>	<ul style="list-style-type: none"> <li>• Industrial Safety 460301</li> <li>• National Electrical Code 460339</li> <li>• Circuits 1/Labs 1,2 460316/317/318</li> <li>• Electrical Construction 1/Lab 460312/314</li> <li>• Electrical Construction 2/Lab 460313/315</li> </ul>	<ul style="list-style-type: none"> <li>• Digital Literacy 480101</li> <li>• Basic Troubleshooting 470317</li> <li>• Basic Blueprint Reading 460902</li> <li>• Electrical Motor Controls/Lab 460331/332</li> <li>• Co-Op 460345</li> <li>• Internship 460348</li> <li>• Personal Finance 060170</li> <li>• Special Problems I (Electric)</li> </ul>
<p style="text-align: center;"><b>Industrial Electrician Helper</b> CIP 46.0302.00</p> <p><u><i>Tests for Certification:</i></u></p> <ul style="list-style-type: none"> <li>• KOSSA – Construction Test</li> <li>• NCCER – CORE Curriculum</li> <li>• NCCER – Electricity Level 1</li> </ul>	<ul style="list-style-type: none"> <li>• Industrial Safety 460301</li> <li>• National Electrical Code 460339</li> <li>• Circuits 1/Labs 1,2 460316/317/318</li> <li>• Circuits 2/Labs 1,2 460319/320/322</li> <li>• Electrical Construction 2/Lab 460313/315</li> </ul>	<ul style="list-style-type: none"> <li>• Sustainable Energy Systems/Lab 460340/341</li> <li>• Basic Troubleshooting 470317</li> <li>• Renewable Energy Systems/Lab 460342</li> <li>• Rotating Machinery/Lab 460323/324</li> <li>• Transformers/Lab 460305</li> <li>• Rotating Machinery Electric Motor Controls I/Lab 460325/326</li> <li>• Special Problems I (Electric)</li> </ul>
<p style="text-align: center;"><b>Residential Electrician</b> CIP 46.0302.01</p> <p><u><i>Tests for Certification:</i></u></p> <ul style="list-style-type: none"> <li>• KOSSA – Construction Test</li> <li>• NCCER – CORE Curriculum</li> <li>• NCCER – Electricity Level 1</li> </ul>	<ul style="list-style-type: none"> <li>• Industrial Safety 460301</li> <li>• National Electrical Code 460339</li> <li>• Circuits 1/Labs 1,2 460316/317/318</li> <li>• Basic Trouble Shooting 470317</li> <li>• Electrical Construction 2/Lab 460313/315</li> </ul>	<ul style="list-style-type: none"> <li>• Circuits 2/Labs 1,2 460319/320/322</li> <li>• Electrical Constructional Construction 2/Lab 460313/315</li> <li>• Basic Blueprint Reading 460902</li> <li>• Electrical Motor Controls I /Lab 460331/332</li> <li>• Special Problems I (Electric)</li> </ul>

# SAMPLE CAREER PATHWAY/ELECTRICITY

## SAMPLE

### KENTUCKY CAREER PATHWAY/PROGRAM OF STUDY TEMPLATE

SA

COLLEGE/UNIVERSITY: Eastern Kentucky University CLUSTER: Construction  
 HIGH SCHOOL (S): Barren County High School PATHWAY: Construction Management  
 PROGRAM: Electrical Technology

	GRADE	ENGLISH	MATH	SCIENCE	SOCIAL STUDIES	REQUIRED COURSES			CREDENTIAL CERTIFICATE DIPLOMA DEGREE	SAMPLE OCCUPATIONS
						RECOMMENDED ELECTIVE COURSES	OTHER ELECTIVE COURSES	CAREER AND TECHNICAL EDUCATION COURSES		
SECONDARY	9	English I	Algebra I	Earth Science	Economics	History and Appreciation of Visual and Performing Arts	Elective	Computer Applications		
	10	English II	See Construction Geometry	Biology	U.S. History	Elective	Circuits I ENGT 110	Circuits I Lab ENGT 111/113	Career Major H.S. Graduate	
	11	English III	Algebra II	Physical Science	World Geography	Health & PE	Basic TRO SH BTX 105	ELEC CON I EET 154/155	ELEC HELP 472111.00.06	Electrician's Helper
	12	English IV	4th Math				Circuits I I ENGT 114	Circuits I I / Lab ENGT 115/116	ELEC CON II EET 254 EET255 EET259	Residential Electrician I 472111.00.03
	Take ACT - Apply for admission to Eastern Kentucky University								*ONet Certificates	
POSTSECONDARY	Year 13	Writing	Math	Science	Computer Applications	Materials and Methods of Construction	Intro to Construction	Estimating		
	Year 14	Communications	Math	Humanities	Social Interaction	Plane Surveying	Managerial Reports	Soils and Foundations		
	Year 15	Communications	Humanities	Psychology	Economics	Construction Contracts	Estimating II	Occupational Safety		
	Year 16	Arts and Humanities	Math	Science		Structural Systems	Strength of Materials	Surveying	Bachelor's Degree	Construction Manager

**CCTI**  
 College and Career Transitions Initiative  
 Funded by the U. S. Department of Education (V051B020001)  
 Revised Jan. 2005  
 October, 2006-CTE/Kentucky

**Required Courses**  
**Recommended Elective Courses**  
**Other Elective Courses**  
**Career and Technical Education Courses**  
**Credit-Based Transition Programs (e.g. Dual/Concurrent Enrollment, Articulated Courses, 2+2+2)**  
 =High School to Comm. College) (\* =Com. College to 4-Yr Institution) (# = Opportunity to test out)  
**Mandatory Assessments, Advising, and Additional Preparation**

**Note:** Categories of courses (e.g. Required, Recommended Electives, other Electives and career and Technical Education) apply to both secondary and postsecondary levels.

**Personal Finance**

**060170**

**Course Description**

Information needed to make intelligent choices and take effective action in the management of personal resources is provided. Topics include financial planning, buying, borrowing, saving, budgeting, investing, insurance, and taxes to personal finances.

**Content/Process**

1	Compare major economic systems in the global economy	
2	Identify sources of consumer information, protection, rights, and responsibilities	
3	Describe the characteristics and services of financial institutions	
4	Demonstrate the use of personal financial statements, budgets, and other financial tools to evaluate financial health.	
5	Identify options available for managing cash and liquid assets	
6	Identify investment opportunities	
7	Compare and evaluate consumer credit	
8	Develop strategies for making smart buying decisions with regard to housing, transportation, and consumer goods	
9	Identify major types of employee benefits	
10	Complete various types of tax forms	
11	Explain basic tax concepts and effective tax minimization strategies	
12	Identify and compare basic types of health, life, auto and homeowner/renter insurance	
13	Explain the basic financial markets and investment options	
14	Explain and discuss contingency planning, including retirement and estate planning	
15	Compute various financial transactions, such as account reconciliation, interest, capital gains, etc.	
16	Identify ergonomics and understand why ergonomics is important from a health point of view	

17	Demonstrate accountability of and the safe and responsible use of company resources, office equipment, machines, etc.	
18	Apply Internet etiquette and safety	
19	Identify safety rules applicable to this course and demonstrate appropriate observance of said rules, including but not limited to, trip hazards, electrical cords and outlets, evacuation procedures for emergency situations (including fire, tornado, bomb threat, earthquake, etc.), lockdown procedures for emergency situations, location and contents of first aid kit, MSDS sheets, etc.	

**Connections:**

**\*Common Core State Standards**

**\*KOSSA**

**\*Common Core Technical Standards**

**\*New Generation Science Standards**

**CTSO's – Skills**

	<b>DIGITAL LITERACY</b>	
	<b>480101</b>	
<b>Course Description</b>		
<p>The impact of computers on society, and ethical issues are presented. Students use a computer and application software, including word processing, database, spreadsheets, presentation software, and the Internet, to prepare elementary documents, reports, and electronic presentations.</p>		
<b>Content/Process</b>		
<b>1</b>	Use a word processing program to create, save, print, modify, spell-check, and grammar-check a simple document	
<b>2</b>	Use a word processing program to enhance the appearance of a simple document by using centered, right-justified, boldfaced, underlined, and italicized text	
<b>3</b>	Use a word processing program to change the default margins and line spacing	
<b>4</b>	Use a word processing program to create a document with headers, footers, and footnotes	
<b>5</b>	Use an electronic spreadsheet to create, save, print, modify, and obtain graphs from a simple spreadsheet.	
<b>6</b>	Use an electronic spreadsheet to perform basic mathematical operations including, but not limited to addition, subtraction, multiplication, and division	
<b>7</b>	Use an electronic spreadsheet to calculate averages and percent's	
<b>8</b>	Use an electronic spreadsheet program to enhance the appearance of a spreadsheet by changing fonts, foreground and background colors; and centering text across columns	
<b>9</b>	Use a database management program to create, maintain, and print reports from a simple relational database	
<b>10</b>	Use a database management program to customize the user interface by creating and maintaining forms and reports	
<b>11</b>	Use a database management program to query tables using basic query operations such as "and", "or", "not", etc.	
<b>12</b>	Print in landscape and portrait orientations	

13	Use the component of the operating system that helps the user manipulate files and folders to copy, move, rename, and delete files; and to create, copy, move, rename, and delete folders	
14	Use a World Wide Web browser to navigate hypertext documents and to download files	
15	Use Internet search engines and understand their advantages and disadvantages	
16	Use an electronic mail program to send and receive electronic mail	
17	Discriminate between ethical and unethical uses of computers and information including e-mail and internet etiquette	
18	Demonstrate a basic understanding of issues regarding software copyright, software licensing, and software copying	
19	Demonstrate an awareness of computer viruses and a basic understanding of ways to protect a computer from viruses	
20	Demonstrate a basic understanding of the impact of computers on society	
21	Use and understand basic computer terminology	
22	Identify types of computers, how they process information and how individual computers interact with other computing systems and devices	
23	Identify the function of computer hardware components	
24	Identify the factors that go into an individual or organizational decision on how to purchase computer equipment	
25	Identify how to maintain computer equipment and solve common problems relating to computer hardware	
26	Identify how software and hardware work together to perform computing tasks and how software is developed and upgraded	
27	Identify different types of software, general concepts relating to software categories, and the tasks to which each type of software is most suited or not suited	
28	Identify what an operating system is and how it works, and solve common problems related to operating systems	
29	Manipulate and control the Windows desktop, files, and disks	
30	Identify how to change system settings, install and remove software	
31	Be able to start and exit a Windows application and utilize sources of online help	

32	Identify common on-screen elements of Windows applications, change application settings and manage files within an application	
33	Describe and implement the protocol of utilizing presentation software.	
34	Use a presentation program to create, save, modify, spell check, and grammar-check a simple presentation.	
35	Deleted Task	
36	Use a presentation program to enhance the appearance of the slide designs, background colors, and layout.	
37	Utilize the print features in a presentation to include handouts, speaker's notes, and black and white.	

**Connections:**

\*Common Core State Standards

\*KOSSA

\*Common Core Technical Standards

\*New Generation Science Standards

\*Post-Secondary: KCTCS DLC 100

CTSO's – Skills USA

**Industrial Safety**

**460301**

**Course Description**

**This course provides practical training in industrial safety. The students are taught to observe general safety rules and regulations, to apply work site and shop safety rules, and to apply OSHA regulations. Students are expected to obtain certification in first aid and cardiopulmonary resuscitation.**

**Content/Process**

<b>1</b>	<b>Apply work site and lab safety procedures</b>	
<b>2</b>	<b>Apply personal safety rules and procedures</b>	
<b>3</b>	<b>Apply fire prevention rules and procedures</b>	
<b>4</b>	<b>Obtain first aid certification</b>	
<b>5</b>	<b>Obtain CPR certification</b>	
<b>6</b>	<b>Demonstrate hazardous communications procedures</b>	
<b>7</b>	<b>Describe and demonstrate universal precautions procedures</b>	

**Connections:**

**\*Common Core State Standards**

**\*KOSSA**

**\*Common Core Technical Standards**

**\*New Generation Science Standards**

**CTSO's – Skills**



## Basic Blueprint Reading

460902

### Course Description

This course presents basic applied math, lines, multiview drawings, symbols, various schematics and diagrams, dimensioning techniques, sectional views, auxiliary views, threads and fasteners, and sketching typical to all shop drawings. Safety will be emphasized as an integral part of the course.

### Content/Process

1	Introduction and math review (fractions and decimals)	
2	Identify the alphabet of lines	
3	Identify multiple views	
4	Arrange multiple views	
5	Arrange two-view drawings	
6	Identify one-view drawings	
7	Arrange and identify auxiliary views	
8	Demonstrate the use of size and location dimensions	
9	Demonstrate proper dimensions of cylinders and arcs	
10	Size dimensions of holes and angles	
11	Locate dimensions for centering of holes, points, and centers	
12	Interpret the base line dimensions on drawings	
13	Identify half, full, and removed sections	
14	Identify electrical schematic and diagram symbols	
15	Identify welding symbols and equipment	
16	Interpret ordinate and tabular dimensions	
17	Set tolerances using geometric dimensioning techniques	
18	Sketch parts with irregular shapes	
19	Sketch oblique views of various parts	
20	Sketch and dimension shop drawings	
21	Dimension parts using shop notes	
22	Calculate tolerances	

23	Identify labeling of various screw threads	
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24	Calculate tapers and machined surfaces	
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25	Interpret connections and flow of various electrical, hydraulic, and pneumatic schematics and diagrams	
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<b>Connections:</b> *Common Core State Standards *KOSSA *Common Core Technical Standards *New Generation Science Standards CTSO's – Skills		
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## INTERNSHIP EDUCATION

460348

### Course Description:

Internship provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Internship do not receive compensation.

### Content/Process

#### The Student Will:

1. Gain career awareness and the opportunity to test career choice/s.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability after graduation.

### Connections:

\*Common Core State Standards

\*KOSSA

\*Common Core Technical Standards

\*New Generation Science Standards

CTSO's – Skills

## CO-OP EDUCATION

460345

### Course Description:

CO-OP provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the CO-OP do receive compensation as outlined in the Work-based Learning manual.

### Content/Process

#### The Student Will:

1. Gain career awareness and the opportunity to test career choice/s.
2. Receive work experience related to career interests prior to graduation.
3. Integrate classroom studies with work experience.
4. Receive exposure to facilities and equipment unavailable in a classroom setting.
5. Increase employability after graduation.

### Connections:

\*Common Core State Standards

\*KOSSA

\*Common Core Technical Standards

\*New Generation Science Standards

CTSO's – Skills

## Basic Troubleshooting

470317

Course Description		
<p>This course explores the science of troubleshooting and the importance of proper maintenance procedures; how to work well with others, aids in communication, and trade responsibilities; examines actual troubleshooting techniques, aids in troubleshooting, and how to use schematics and symbols; focuses on specific maintenance tasks such as solving mechanical and electrical problems, breakdown maintenance, and the how's and whys of planned maintenance.</p>		
Content/Process		
1	Explain the reason efficient troubleshooting is important in a production plant	
2	List the steps in troubleshooting a machine/system	
3	Demonstrate good communication skills when dealing with plant personnel	
4	List the questions that should be asked when a machine system fails	
5	List the questions that should be asked when a machine/system fails	
6	List the signs of a machine in need of service	
7	List the information that should be recorded in a machine equipment record	
8	Identify calibration standards	
9	Identify different troubleshooting test equipment	
10	Use schematics when troubleshooting	
11	Identify differences in schematics when troubleshooting	
12	Use a troubleshooting chart	
13	Identify bearing wear problems	
14	Identify pump failure problems and solutions	
15	Identify types of hosing	
16	Identify current voltage characteristics of wire	
17	Apply all safety rules when working with electrical equipment	

18	Identify a pictorial diagram, a blocking diagram, and a schematic diagram	
19	Demonstrate how to troubleshoot an electrical problem	
20	List preventive maintenance procedures	

**Connections:**

**\*Common Core State Standards**

**\*KOSSA**

**\*Common Core Technical Standards**

**\*New Generation Science Standards**

**CTSO's – Skills**

# Transformers

460305

Course Description		
Focuses on the operation, installation and application of AC single-phase and three-phase transformers. Testing and maintaining transformer equipment are emphasized, with safety integrated as a core component of the study.		
Content/Process		
1	Connect a dual voltage transformer for its highest input and output voltages	
2	Connect a dual voltage transformer for the low voltage input and output	
3	Connect an ammeter to high voltage line using a current transformer	
4	Connect an auto transformer to give a variety of voltages	
5	Connect transformers to supply 3-phase power, 4-2 configuration	
6	Connect transformers to supply 3-phase power, delta configuration	
7	Connect transformers to supply 3-phase power, Y configuration	
8	Connect the secondary of a 3-phase bank to give a 4-wire delta system	
9	Connect 3-single phase transformers to form a delta-delta configuration	
10	Connect 3-single phase transformers to form a delta-star configuration	
11	Connect 3-single phase transformers to form a star-delta 3-phase bank.	
12	Connect 3-single phase transformers to form a star-star 3-phase bank	
13	Connect 2 single-phase transformers in an open-delta configuration	
14	Connect 2 single-phase transformers in parallel	
15	Connect a voltmeter using a potential transformer to determine voltage	

16	Test transformer for output and performance under resistive, capacitive, and inductive loads	
17	Connect buck-boost transformer to increase voltage	
18	Connect buck-boost transformer to decrease voltage	
<b>Connections:</b> *Common Core State Standards *KOSSA *Common Core Technical Standards *New Generation Science Standards CTSO's – Skills		

# Electrical Construction I

460312

Course Description		
Involves the study of materials and procedures used in construction wiring.		
Content/Process		
1	Install circuits using non-metallic sheathed cable.	
2	Install and connect branch circuit grounding.	
3	Install power feeder wiring system to equipment.	
4	Install conductors in conduit or raceway and terminate.	
5	Install underground cable.	
6	Install wire terminals and lugs.	
7	Make splices using approved methods.	
8	Install flexible and liquid tight conduit.	
9	Install electrical metallic tubing.	
10	Install temporary service.	
11	Install main distribution panel.	
12	Install, identify, and label circuit breakers, fuses, and fuse adapter in distribution panels (including AFCI breakers).	
13	Install underground and overhead service entrances.	
14	Test circuits for proper operation.	
15	Inventory equipment, materials, and supplies.	
16	Complete an accident or incident report.	
17	Install lighting dimmer systems.	
18	Mark location of switches and outlets on studding.	
19	Locate room center for ceiling outlets.	
20	Mark location of single system components.	
21	Layout and install single and ganged boxes both flush and surface mounted (new construction).	
22	Layout and install ganged boxes both flush and surface mounted (old construction).	

23	Install switches - single pole, three-way, and four-way.	
24	Install duplex and special purpose receptacles (including GFCI).	
25	Install lighting fixtures (incandescent, fluorescent, LED, recessed and surfaced).	
26	Install door chime, switches, and transformer.	
27	Test emergency lighting system.	
28	Connect automatic garage door opener.	
29	Install overhead fan or fanlight with controls.	
30	Connect or troubleshoot water heaters.	
31	Install single-phase dual voltage motors.	
32	Connect combination heating-cooling unit.	
33	Connect ceiling or wall heating panel.	
34	Install baseboard heating unit.	
35	Install line and low voltage thermostats.	
36	Install radio, TV, and telephone outlets.	
37	Compile a bill of materials from wiring diagrams drawn to specifications.	
38	Draw wiring diagrams to specifications.	
39	Estimate total cost of a specific installation.	

**Connections:**

**\*Common Core State Standards**

**\*KOSSA**

**\*Common Core Technical Standards**

**\*New Generation Science Standards**

**CTSO's – Skills**

## Cooperative Education I

460345

Course Description		
Cooperative Education provides supervised on-the-job work experience related to the student's educational objectives. Students participating in the Cooperative Education program receive compensation for their work.		
Content/Process		
1	Gain career awareness and the opportunity to test career choice(s)	
2	Receive work experience related to career interests prior to graduation	
3	Integrate classroom studies with work experience	
4	Receive exposure to facilities and equipment unavailable in a classroom setting	
5	Enhance employability	
6	Earn funds to help finance education expenses	
<b>Connections:</b> *Common Core State Standards *KOSSA *Common Core Technical Standards *New Generation Science Standards CTSO's – Skills		

# National Electrical Code

460339

Course Description		
<p>Emphasizes the importance of the National Electrical Code as it applies to electrical installations: electrical safety issues, prevention of fire due to the use of electrical energy, prevention of loss of life and property from the hazards that might arise from the use of electrical energy, and proper selection of electrical equipment for hazardous and non-hazardous environments. A learning resource in the preparation for electrical licensing examinations.</p>		
Content/ Process		
1	Apply National Electrical Code (NEC) terms and concepts.	
2	Summarize the NEC style.	
3	Use formal methods in finding code requirements.	
4	Determine the purpose, scope, and enforcement of the NEC.	
5	Examine the mandatory rules and formal interpretation of the NEC.	
6	Apply definitions for proper understanding and application of the NEC rules.	
7	Determine guidelines for electrical equipment approval.	
8	Apply NEC rules for conductor termination and splices.	
9	Examine working space and working space entrances for electrical equipment.	
10	Utilize methods to identify disconnects and circuits.	
11	Associate the difference between a grounded and neutral conductor.	
12	Determine the purpose of a grounded conductor.	
13	Differentiate between a grounded and grounding conductor.	
14	Use methods to identify the grounded and grounding conductor.	
15	Determine the rules for multiwire branch circuits.	
16	Apply NEC rules for receptacles and lighting in dwelling units.	
17	Calculate wire size for continuous and non-continuous loads.	

18	Define feeder and how it relates to service and branch circuit conductors.	
19	Calculate conductor and overcurrent protection size for feeders.	
20	Identify requirements for high-leg conductors.	
21	Demonstrate an understanding of requirements for clearances, grounding, and raceways for outside branch circuits and feeders.	
22	Utilize code requirements for service disconnecting means.	
23	Determine NEC rules for overhead and lateral services.	
24	Determine the number and grouping of service disconnect means by occupancy.	
25	Protect circuits with overcurrent protection devices, such as fuses and circuit breakers in a variety of locations and occupancies.	
26	Apply grounding to equipment through permitted NEC bonding measures.	
27	Bond separately derived electrical systems.	
28	Identify bonding methods for services and communication equipment.	
29	Determine when equipment is considered effectively grounded.	
30	Utilize NEC rules for installing raceway systems and their associated wiring methods, including box size and conduit fill calculations.	
31	Demonstrate an understanding of the general requirements for all wiring methods by occupancy listed in the NEC, including dwelling optional load calculations.	
32	Determine the rules for temporary wiring on construction sites.	
33	Apply NEC tables to determine conductor size and de-rating factors for general wiring.	
34	Apply general code requirements for conductors, such as insulation markings, ampacity ratings, and their use.	
35	Determine installation location and primary uses for a variety of cable and electrical raceways.	
36	Apply the rules for working space and dedicated space for switchboards and panel boards.	
37	Determine the types and approval for use of flexible cords and cables.	

38	Utilize the NEC requirements for installing lighting fixtures, lamp holders, lamps and receptacles.	
39	Size conductors and calculate overcurrent protection for a variety of appliances.	
40	Determine installation requirements for electrical space heating, motors, motor circuits and controllers.	
41	Utilize the NEC to determine disconnecting means, overcurrent protection and conductor sizing of air-conditioning and refrigeration equipment.	
42	Calculate primary and secondary overcurrent protection for transformers.	
43	Apply code requirements for installing transformers and transformer vaults.	

**Connections:**

**\*Common Core State Standards**

**\*KOSSA**

**\*Common Core Technical Standards**

**\*New Generation Science Standards**

**CTSO's – Skills**

**Electrical Construction II  
460313**

<b>Course Description</b>		
<b>Expands the knowledge and skills needed to work in commercial and industrial construction wiring.</b>		
<b>Content/Process</b>		
1	Lace cable and wires in open raceways and control panels	
2	Install multi-conductor cables	
3	Install non-metallic conduits for above and below ground installation	
4	Install rigid conduit	
5	Ground service to metallic bonding systems	
6	Install busways	
7	Install explosion proof fixtures and devices	
8	Install lay-in duct work (wireways)	
9	Install plug-in busways	
10	Install under-floor raceways	
11	Install low-voltage lighting controls	
12	Install photo-electric control	
13	Connect PC-based climate control equipment	
14	Install snow and ice melting equipment	
15	Install dynamic, switching, and resistive sensing devices	
16	Install intercom and public address systems	
17	Draw control panel diagrams	
18	Draw external power diagrams	
19	Connect emergency backup systems (rotary and solid-state types)	
20	Run fiber optic cable in raceways	
<b>Connections:</b> *Common Core State Standards *KOSSA *Common Core Technical Standards *New Generation Science Standards CTSO's – Skills		

# Rotating Machinery

460323

Course Description		
Focuses on the underlying principles of rotating electrical equipment including DC and AC motors and generating equipment construction, operating applications, and the maintenance of DC and AC motors and generating equipment.		
Content/Process		
1	Describe the installation and measurement of DC series motor speed/torque characteristics.	
2	Describe the installation and measurement of DC shunt motor speed/torque characteristics.	
3	Describe the installation and measurement of DC compound motor speed/torque characteristics.	
4	Describe the installation and measurement of DC series generator counter torque/voltage/speed characteristics.	
5	Describe the installation and measurement of DC shunt generator counter torque/voltage/speed characteristics.	
6	Describe the installation and measurement of DC compound generator counter torque/voltage/speed characteristics.	
7	Explain how to change the output voltage of DC generators.	
8	Explain how to vary the output voltage on AC alternators through field excitation.	
9	Describe connection of instrumentation to measure frequency in AC alternators.	
10	Describe how to parallel-connect two three-phase AC alternators so their voltages and frequencies are synchronized.	
11	Use the National Electrical Code to size and install AC alternators.	
12	Use electrical control equipment to vary the speed of single-phase AC motors.	
13	Use mechanical and electrical instruments to measure the start and run torque of motors.	
14	Explain how to vary the input voltage and measure speed/torque characteristics of single-phase AC motors.	

15	Describe how to measure the speed/torque characteristics of capacitor-start, single-phase AC motors.	
16	Describe how to measure the speed/torque characteristics of capacitor-run, single-phase AC motors.	
17	Describe how to measure the speed/torque characteristics of repulsion-induction, single-phase AC motors.	
18	Describe how to measure the speed/torque characteristics of shaded-pole, single phase AC motors.	
19	Describe how to measure the speed/torque characteristics of split-phase, single phase AC motors.	
20	Use manual and automatic means to change the direction of three-phase AC motors.	
21	Utilize electrical control equipment to vary the speed of three-phase AC motors.	
22	Configure three-phase AC motor stators to operate in delta.	
23	Configure three-phase AC motor stators to operate in wye.	
24	Explain how to measure the speed/torque characteristics of three-phase synchronous AC motors.	
25	Explain how to measure the speed/torque characteristics of three-phase squirrel-cage AC motors.	
26	Explain how to measure the speed/torque characteristics of three-phase wound-rotor AC motors.	
27	Describe the preventative and permanent maintenance on AC and DC electrical rotary equipment.	
28	Size feeder conductors and overcurrent protection for AC and DC rotating equipment according to the standards summarized in the National Electrical Code.	

**Connections:**

**\*Common Core State Standards**

**\*KOSSA**

**\*Common Core Technical Standards**

**\*New Generation Science Standards**

**CTSO's – Skills**

# Rotating Machinery Electrical Motor Controls I

460325

<b>Course Description</b>		
<b>This course focuses on the construction, operation and maintenance of DC motors and generators and AC motors and alternators. This course addresses the diversity of control devices and applications used in industry today. Safety and electrical lockouts are also included.</b>		
<b>TASK LIST</b>		
1	Change the output voltage of alternators	
2	Measure the frequency of alternators	
3	Install two three-phase alternators in parallels	
4	Install alternators	
5	Change speed of single phase motors	
6	Measure the torque of motors	
7	Connect single-phase motor to run on different voltages	
8	Connect and test capacitor start motors	
9	Connect and test capacitor run motors	
10	Connect and test repulsion-induction motors	
11	Connect and test shaded pole motors	
12	Replace split-phase motors	
13	Change the direction of rotation of electrical motors	
14	Connect three-phase motors to run on different voltages	
15	Connect three-phase motor stator for delta operations	
16	Connect three-phase motor stator for star operations	
17	Connect and test synchronous motors	
18	Connect and test three-phase induction motors	
19	Connect and test wound rotor motors	
20	Install and test DC series motors for serviceability	
21	Install and test DC shunt motors for serviceability	
22	Install and test DC compound motors for serviceability	
23	Install and test DC series generators for serviceability	

24	Install and test DC shunt generators for serviceability	
25	Install and test DC compound generators for serviceability	
26	Change output voltages of DC generators	
27	Connect control relay systems	
28	Connect dynamic braking circuit for AC motors	
29	Connect dynamic braking circuit for DC motors	
30	Test magnetic starters	
31	Connect overload relays into starting control circuits	
32	Connect potential type motor starting relays	
33	Connect reduced voltage starters	
34	Connect time delay relays	
35	Connect motor for automatic controls	
36	Connect automatic reduced voltage starter for DC motor control	
37	Connect control relay systems	
38	Connect limit switches	
39	Connect motor control circuits for plugging	
40	Connect point starters for DC motors	
41	Connect push button stations	
42	Connect selector switches	
43	Connect sensing devices (non-electric)	
44	Connect magnetic starters	

**Connections:**

**\*Common Core State Standards**

**\*KOSSA**

**\*Common Core Technical Standards**

**\*New Generation Science Standards**

**CTSO's – Skills**

# Electrical Motor Controls I

460331

Course Description		
This course addresses the diversity of control devices and applications used in industry today. Safety and electrical lockouts are also included.		
Content/Process		
1	Demonstrate an understanding of schematics (wiring diagrams, ladder diagrams, etc.)	
2	Connect dynamic braking circuit for AC motors	
3	Connect dynamic braking circuit for DC motors	
4	Test magnetic starters	
5	Connect overload relays into starting control circuits	
6	Connect potential type motor-starting relays	
7	Connect reduced voltage starters	
8	Connect time delay relays	
9	Connect motor for automatic controls	
10	Connect automatic reduced voltage starter for DC motor control	
11	Connect control relay systems.	
12	Connect limit switches	
13	Connect motor control circuits for plugging	
14	Connect point starters for DC motors	
15	Connect push button stations	
16	Connect selector switches	
17	Connect sensing devices (non-electric)	
18	Connect magnetic starters	
<b>Connections:</b> *Common Core State Standards *KOSSA *Common Core Technical Standards *New Generation Science Standards CTSO's – Skills		

Special Problems I - Electrical Technology

460377

Course Description		
A course designed for the student who has demonstrated specific special needs.		
Content/Process		
1	Selected tasks/problems as determined by the instructor	
<b>Connections:</b> *Common Core State Standards *KOSSA *Common Core Technical Standards *New Generation Science Standards CTSO's – Skills		

## Circuits I

460316

Course Description		
Introduction to basic theory of DC and AC circuits, including circuit analysis techniques, introductory magnetism, and transformer principles.		
Content/Process		
1	Solve series and parallel DC circuits.	
2	Demonstrate an understanding of electrical safety principles.	
3	Describe the use of hand tools and basic test equipment.	
4	Explain simple DC voltage and current divider circuits.	
5	Demonstrate an understanding of resistance, capacitance, and inductance.	
6	Solve simple time-constant circuits, both R-C and R-L.	
7	Use Kirchoff's Laws to analyze DC circuits.	
8	Demonstrate an understanding of basic magnetism and AC principles.	
9	Demonstrate an understanding of basic transformers.	
10	Demonstrate proficiency in the use of common electrical laboratory instrumentation.	
11	Exhibit verbal and written communication skills through teamwork and technical reports.	
12	Demonstrate an understanding of basic electrical measuring instruments such as those used for: voltage measurement, current measurement, and resistance measurement.	
13	Demonstrate an understanding of Ohm's law and be able to perform a basic calculation.	
14	Understand basic theory of and applications to electric circuits for Series Circuits, Parallel Circuits, and Series-Parallel Circuits.	
15	Demonstrate basic soldering skills.	
<b>Connections:</b> *Common Core State Standards *KOSSA *Common Core Technical Standards *New Generation Science Standards CTSO's – Skills		

## Circuits II

460319

<b>Course Description</b>		
<b>Complex alternating current and direct current circuits. Emphasis is on impedance, reactance, power and electrical energy, electrical measurement instruments, and circuit analysis.</b>		
<b>Content/Process</b>		
1	Explain the design of complex DC and AC series, parallel, and series/parallel circuits.	
2	Use Thevenin, Norton, Loop, and Mesh analysis and superposition to solve AC and DC circuits.	
3	Demonstrate an understanding of AC power, electrical energy, and power factor correction.	
4	Exhibit a working knowledge of phasors and complex numbers (polar and rectangular forms).	
5	Demonstrate a working knowledge of 3-phase AC.	
6	Demonstrate an understanding of Resonance in AC circuits.	
7	Explain the design of simple low-pass, high-pass, and band-pass passive filter circuits.	
8	Demonstrate an understanding of transformers, 1- and 3-phase.	
9	Exhibit verbal and written communication skills through teamwork and technical reports.	
<b>Connections:</b> *Common Core State Standards *KOSSA *Common Core Technical Standards *New Generation Science Standards CTSO's – Skills		

# Sustainable Energy

460377

Course Description		
Examines the sustainability of various energy resources. An overview of energy technology, energy resources, and emerging future energy technologies coupled with our energy use will bring into context the strengths and weaknesses of different energy methodologies in developing a working concept of sustainable energy.		
Content/Process		
1	Define sustainable energy.	
2	Define and convert various common energy sources to units of measurements in terms of BTU's of energy and power in terms of Watts.	
3	Demonstrate a basic understanding of the physics of heat.	
4	Explain how energy systems interact with local, regional and global environments.	
5	Analyze the basic operation of passive and active solar energy systems and associated sustainability issues.	
6	Describe the basic operation of tidal energy systems and associated sustainability issues.	
7	Explain the basic operation of wind energy systems and associated sustainability issues.	
8	Describe the basic operation of fossil fuel energy systems and associated sustainability issues.	
9	Describe the basic operation of nuclear power energy systems and associated sustainability issues.	
10	Explain how renewable energy systems contribute to the sustainability of energy sources.	
11	Describe the basic operation of biomass energy systems and associated sustainability issues.	
12	Describe the basic operation of hydropower systems and associated sustainability issues.	

13	Assess the basic operation of electrical power generation and associated sustainability issues.	
14	Categorize the sustainability issues associated with residential and commercial building designs.	

**Connections:**

**\*Common Core State Standards**

**\*KOSSA**

**\*Common Core Technical Standards**

**\*New Generation Science Standards**

**CTSO's – Skills**

# Renewable Energy Systems

460342

Course Description		
<p>Examines the need for alternative and renewable energy resources as a survey course providing citizens from all walks of life an understanding for responsible stewardships of technologies that will contribute to the sustainability of energy in our present and future societies. The object of this course is to take a more in-depth look at renewable energy forms and the replacement of fossil fuels in our society. Through wind, solar, and biomass this class will focus on live projects and scientific studies and comparisons of feasibility.</p>		
Content/Process		
1	Define renewable energy.	
2	Identify and describe different types of renewable energy.	
3	Determine costs and tradeoffs of various renewable options.	
4	Identify and describe sources of renewable energy and how they are delivered to customers.	
5	Identify and describe the impact of renewable energy to the environment and the economy.	
6	List and discuss overall issues associated with energy availability, effectiveness, distribution, and regulation.	
<p>Connections: *Common Core State Standards *KOSSA *Common Core Technical Standards *New Generation Science Standards CTSO's – Skills</p>		